

DESIGN NOTES

RF Input Impedance Matching Data for the LTC5564 Schottky Detector – Design Note 1030

John Chung, Bruce Hemp

Introduction

The **LTC®5564** is an UltraFast™ RF power detector for applications in the 600MHz to 15GHz frequency range. It combines a temperature compensated Schottky diode peak detector, a gain selectable operational amplifier and a fast comparator in a 16-lead 3mm × 3mm package.

Performance of the RF detector, specifically detector response and bandwidth, depends on proper impedance matching into the detector RF input. The impedance measurements presented here can be used in conjunction with a CAD simulation tool to simplify the task of RF input impedance matching.

RF Input Impedance Measurement

Input impedance was measured on a LTC5564 demo board DC1646A, modified for minimal RF trace length as shown in Figure 1. For the purpose of this measurement, the detector input DC block was omitted since the test equipment supports DC voltage at its input. In a real world application, a DC block function must be included as part of the matching network design. The measured LTC5564 input impedance is shown in Figure 2 and Table 1.

The phase reference plane for the measurement is 1.1mm away from the edge of the QFN package. This distance was chosen to give a comfortable margin against typical DFM rules regarding the distance between components.

For higher frequencies, the accuracy of the S11 measurement becomes diminished by various factors specific to each individual PCB design, such as ground via inductance, the quality of the microstrip transitions, etc. Nonetheless, the S1P data helps in producing the first cut design, saving development time.

File Links

FILE NAME	CONTENTS
LTC5564_-10dBm.S1P	Input Reflection Coefficient, S11, $P_{IN} = -10\text{dBm}$, Touchstone Format. 101 Freq. Points, 0.5GHz to 16.5GHz.
LTC5564_0dBm.S1P	Input Reflection Coefficient, S11, $P_{IN} = 0\text{dBm}$, Touchstone Format. 101 Freq. Points, 0.5GHz to 16.5GHz.

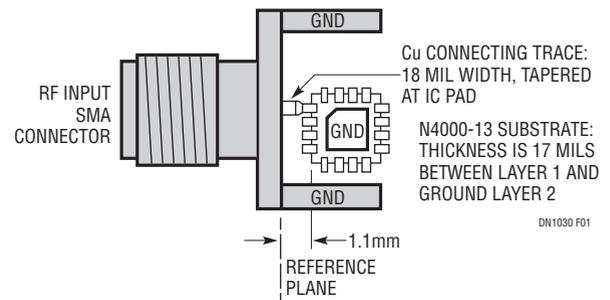


Figure 1. Test Setup Showing Location of the Reference Plane

Note that the input impedance to the Schottky detector is a slight function of RF drive level, as seen in Figure 2. There is no measurable input impedance variation over the specified supply voltage range of 3V to 5.5V.

Refer to the DC1646A demo board manual for several LTC5564 RF input matching circuit examples.

Conclusion

The LTC5564 RF input impedance was measured and converted to a 1-port **S-parameter file**, which can be read by most industry-standard RF CAD programs, expediting the matching process.

LT, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks and UltraFast is a trademark of Linear Technology Corporation. All other trademarks are the property of their respective owners.

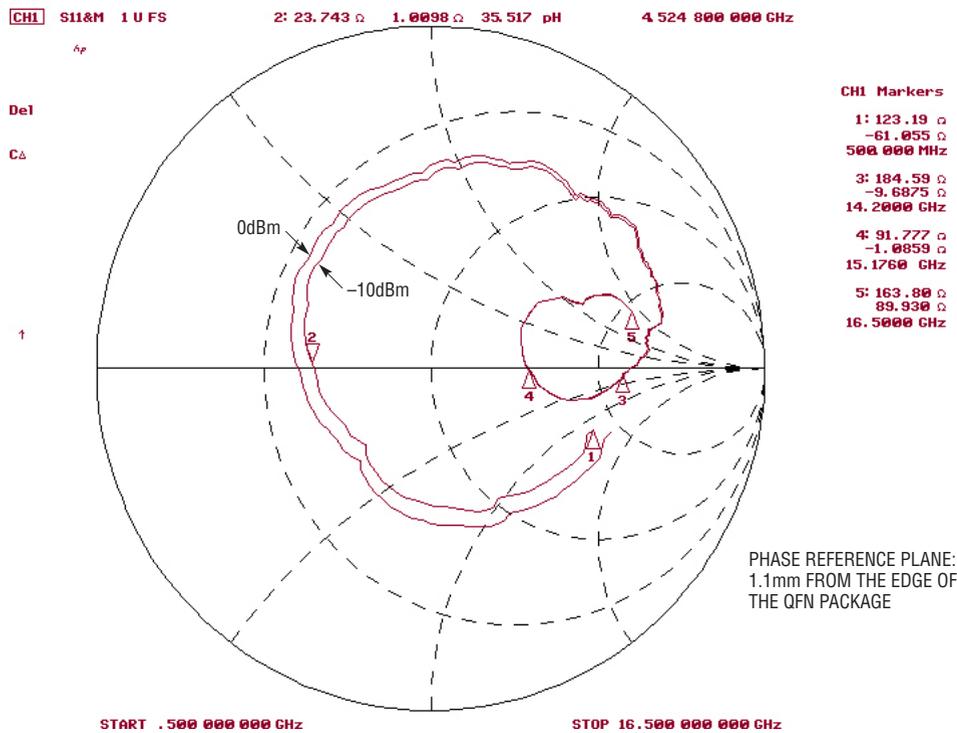


Figure 2. Measured S11 for the LTC5564

Table 1. LTC5564 Input Impedance, $P_{IN} = -10\text{dBm}$

FREQUENCY (GHz)	INPUT IMPEDANCE (SERIES EQUIV.)		VOLT. REFL. COEFF. ($Z_0 = 50\Omega$)		FREQUENCY (GHz)	INPUT IMPEDANCE (SERIES EQUIV.)		VOLT. REFL. COEFF. ($Z_0 = 50\Omega$)	
	R_S	jX_S	MAG	ANG		R_S	jX_S	MAG	ANG
0.5	126.2	-59.8	0.521	-19.4	9.3	50.7	91.2	0.671	47.4
1.3	65.9	-58.6	0.468	-48.0	10.1	63.7	109.7	0.700	38.9
2.1	40.7	-40.3	0.416	-79.0	10.9	92.0	132.1	0.715	29.4
2.9	31.0	-22.5	0.350	-114.7	11.7	120.8	143.3	0.717	23.7
3.7	28.5	-11.2	0.305	-144.2	12.5	170.8	143.6	0.712	16.9
4.5	24.1	-0.1	0.350	-179.7	13.3	211.7	78.6	0.658	9.2
5.3	20.9	12.8	0.442	146.0	14.1	197.7	3.7	0.596	0.6
6.1	21.9	27.1	0.508	115.3	14.9	115.7	-22.0	0.415	-11.0
6.9	26.6	40.9	0.542	91.7	15.7	95.8	46.1	0.425	27.6
7.7	30.3	57.7	0.617	73.1	16.5	168.9	83.8	0.621	14.2
8.5	38.4	76.7	0.663	57.7					

Note: For a less granular version of this data, use the [S1P data file](#) (101 frequency points)

Data Sheet Download

www.linear.com/LTC5564

For applications help,
call (408) 432-1900